

**Systems Plan  
Waste Units Remediation Project  
Southern Waste Units  
Subcontract No. FSC607**

**May 1997  
Revision 0**

**Environmental Remedial Action Project  
Fernald Environmental Management Project  
Fernald, Ohio  
FDF Project No. 20400**



**25 Merchant Street  
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## **LIST OF ILLUSTRATIONS**

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## LIST OF ACRONYMS AND ABBREVIATIONS

FDF	Fluor Daniel Fernald, Inc.
FEMP	Fernald Environmental Management Project
gpm	gallons per minute
HDPE	High-Density Polyethylene
H-O-A	Hand-Off-Auto (selector switch)
kVA	Kilo Volt Amperes
N/A	Not Applicable
MWI	Maintenance Work Instructions
OSDF	On-Site Disposal Facility
SWRB	Storm Water Retention Basin
SWUs	Southern Waste Units
V	Volts

## **2.0            SYSTEM DESCRIPTION AND INTENDED PERFORMANCE**

The retention basin collection and transfer system (see construction drawings and specifications for detailed information) consists of the following:

- 1)     **Retention Basins:** Retention Basins Nos. 1, 2, and 3 collect run-off stormwater and pumped water from the excavation sumps. Water from these basins flows by gravity through risers to the lift stations.
- 2)     **Lift Stations:** Three lift stations are installed (one for each retention basin). Each lift station contains one submersible centrifugal pump. Lift Station No. 1 has a 400 gpm pump; and Lift Stations No. 2 and 3 each have 100 gpm pumps. The lift station pumps discharge to the transfer line. Piping inside the lift station is carbon steel, and underground piping is double-walled, high-density polyethylene (HDPE). Lift Stations No.1 and 2 will be provided with non-installed spare pumps. One common spare will be utilized for Stations No. 2 and 3.
- 3)     **Transfer Line:** Water collected in the lift stations is pumped to the Stormwater Retention Basin (SWRB) through a 6-inch HDPE pipe. This 6-inch HDPE pipe is contained in a 10-inch HDPE pipe. Four clean-outs are provided in the pipeline to permit draining and cleaning of the piping, and three automatic air release valves are provided at high points to remove trapped air.
- 4)     **Wheel Wash Facility:** the wheels of haul trucks will be cleaned of mud and debris at a concrete wash facility. Washing will be accomplished with a motor driven portable cold water pressure washer. Drainage from the facility is routed through an oil-water separator for collection of oil and solid particles.

The intended purpose of the retention basin collection and transfer system is to handle the surface water that will be generated in the SWU's during remediation. The system was designed to handle and manage water generated by runoff from a 10-year 24 hour storm.

## **3.0 OPERATION**

### **3.1 Description of Equipment**

Electrical power at 480 volts, three phase, is supplied to each lift station pump through cable in conduit (ductbank) from a starter rack located near the lift station. A 13.2 kV aerial service will be extended into this area. Local transformers will step voltage down to the 480 volts required.

Electrical controls at the lift station include a pump Hand-Off-Auto (H-O-A) selector switch. During maintenance, the pump(s) may be run manually by placing the selector switch in the "HAND" position. This will bypass the level controls and the pump will continue to run until switched off, regardless of level. Motor overloads in the starter and internal motor protection consisting of a moisture sensor and winding temperature sensors will protect the motor.

The pumps are electric motor-driven, submersible centrifugal pumps with cast iron impellers, cast iron housing, stainless steel shafts, and double mechanical seals. The pumps are designed for guide rail (pipe or cable) installation. Ball valves are manually operated type; check valves are swing type.

A 480 volt, three phase, main fused disconnect switch is located in the starter rack near each lift station. These switches may be used to disconnect all electrical power to the pump starters and local transformer/panel combination.

All electrical equipment enclosures are rated type 3R or 4, according to National Electrical Manufacturers' Association 250, and are located on an equipment rack at each lift station. A 5 kVA, 480-120/240V, single-phase transformer/panel combination is provided with six 20 amp branch circuits. These provide 120 volt power for lighting and a local duplex receptacle.

Submersible power and control cables are furnished with each pump and cable entry seals are designed to ensure a watertight and submersible seal.

The pressure washer is driven by a 480 volt electric motor and delivers 4 gpm of cold water at an operating pressure of 2,200 psig. It is portable and is provided with a gun valve and 100 feet of pressure hose. A 30-foot power cord is provided for connecting to a receptacle located adjacent to the wheel wash facility.

The oil-water separator has a capacity of 220 gallons and is constructed of polymer concrete. It operates on the principle of specific gravity where heavy solid particles (sand, silt, etc.) are trapped in the bottom of an inlet chamber, and lighter than water oil is collected at the surface of the outlet chamber. Clean

water drains out through an outlet from the bottom of the outlet chamber. The separator has no moving parts and no operator attendance is required.

### **3.2 Pre-Startup**

The site preparation subcontractor shall install, test and check the system in accordance with the construction drawings and specifications. Before the system is started, the following checks shall be performed by Fluor Daniel Fernald, Inc. (FDF).

- 1) Check the construction acceptance documents to ensure that every component is constructed according to the plans and specifications and acknowledge acceptance.
- 2) Check the accuracy of the documents for all applicable and relevant functional technical tests (shop or field) for the electrical and mechanical equipment and acknowledge acceptance.
- 3) Make sure that all relevant site-specific procedural requirements, permits, and coordinations are complete.

Pre-startup tests shall be performed in the following order: (1) electrical and (2) mechanical. The Site Preparation Subcontractor shall install, start up, test, and implement until turnover of the system to the Excavation Subcontractor. The Excavation Subcontractor will implement and ensure the system is functional for the duration of excavation and remove all as part of site restoration.

#### **3.2.1 Electrical Pre-Startup Tests and Inspections**

- 1) The 13.2kV overhead feeder line should be energized. Check voltage at the main 480 V disconnect switch after local step down transformer. Voltage should measure a minimum of 475 volts between phases.
- 2) Visually inspect the interior of the starter for completion of installation, including control transformer, lights, and H-O-A switch. Verify installation of motor overload heaters sized in accordance with the pump manufacturer's instructions.
- 3) Verify installation of fuses in main disconnect switch. Throw the switch to the "ON" position to supply power to the starter and distribution transformer/panel.
- 4) Switch on the distribution panel main circuit breaker, secondary main breaker, and branch circuit breakers for the light and receptacles. Verify 120 volts available at receptacles, with correct polarity and grounding. Verify operation of Ground Fault Circuit Interrupter circuit breakers.

- 5) Cover the photocell on the light fixture to check operation of the lamp.

### **3.2.2      Mechanical Pre-Startup Tests and Inspections**

- 1) Visually inspect the mechanical installation and equipment, noting completion of construction.
- 2) Position the manual valves as listed below:

Table 3-1 - Manual Valve Operating Positions

Valve No.	Location	Initial Position
V100	Lift Station No. 1	N/A (check valve)
V101	Lift Station No. 1	Open
V102	Lift Station No. 2	N/A (check valve)
V103	Lift Station No. 2	Open
V104	Lift Station No. 3	N/A (check valve)
V105	Lift Station No. 3	Open
V106 through V109	CO-1 through CO-4	Closed

## **3.3      Startup (By Subcontractor)**

The following are the steps needed for startup of the retention basin collection and transfer system. The steps should be followed in the order listed.

### **3.3.1      Electrical**

The FDF lockout/tagout procedures shall be followed during the testing phases of construction to safeguard personnel from electrical hazards. Construction acceptance testing shall be witnessed and documented by the FDF Quality Assurance/Quality Control Department.

NOTE: To prevent operation of the pump during the following tests 1 through 4, temporarily disconnect power leads to the pump motor at the contactor terminals or remove overload heaters (see Drawing 92X-5900-E-00380, Sheet No. E0007).

- 1) Throw the fused disconnect switch to the "ON" position, applying power to the starter and associated control circuits. Verify that the correct voltage is present.
- 2) Turn the H-O-A switch for each pump to "HAND." Verify that the main contactor energizes and that the "PUMP RUNNING" indicating light is on.
- 3) The pumps are equipped with internal thermal and moisture detectors. Disconnect the control wires at the terminal block for each pump, one wire at a time to verify continuity through these circuits.
- 4) Disconnect the power using the fused disconnect switch and reinstall the motor wiring or heater elements for normal operation of the pumps.
- 5) With water in the sump, operate each pump in the "HAND" position and verify pump operation, checking for correct rotation and any abnormal operation or vibration.

### **3.3.2      Mechanical**

- 1) Fill the lift station No. 1 wet well with clean water to approximately midway between the low-level stop and high-level start positions. Verify that H-O-A selector switch is in the "OFF" position.
- 2) Turn the H-O-A selector switch to "HAND" and observe the following:
  - (1) Check the pump for normal operation without unusual sounds.
  - (2) Check for leakage at the discharge elbow connection.
- 3) Turn the H-O-A selector switch to "OFF" if any unusual conditions are observed. If the pump is running normally, stop it when the water level reaches the low-level stop. Correct any problems encountered before proceeding further with the startup.
- 4) Reset the H-O-A selector switch to "AUTO" and refill the sump with water. Check to see that the pump starts properly at the high-level start position and stops at the low-level stop position.
- 5) Repeat Steps 1 through 4 for Lift Stations No. 2 and No. 3.
- 6) Working with the equipment supplier, perform acceptance operating tests to demonstrate the ability of each pump to meet the full range of operating flow rates and operating points as shown on pump curves.



### 3.3.3 Shutdown

At the successful completion of the above tests and checks, turn all the switches and controls to the "OFF" position.

## 3.4 **System Procedures**

During construction, the pumps will be operated with the local pump H-O-A selector switches set in the "AUTO" position. Pump start will be automatically initiated by water level in accordance with the wet well level controls. The level control signal completes the circuit to the starter contactor, starting the pump. The circuit is maintained until a low level signal is received from the level controls, which drops out the relay and the starter contactor. Operation of the pump is indicated by a red "run" indicating light. Operation of the pressure washer should be by a qualified person in accordance with the manufacturer's operation manual.

Table 3-1 lists the manual valve operating positions.

## 3.5 **Potential Problems**

### 1) Description and Remedy:

**Caution:** Comply with current FDF lockout/tagout procedures before attempting a remedy.

<u>Problem</u>	<u>Result</u>	<u>Remedy</u>
Pump fails to start	Wet well fills to high level alarm point	1) Refer to vendor Operations and Maintenance (O&M) Manual. 2) Check if 480 volt power is energized. 3) Check selector switch position. 4) Check for tripped overload relay. 5) Check continuity of motor internal protection circuits (repair motor). 6) Check/repair level controls. 7) Install spare pump/motor.
Pump fails to stop	Pump runs dry	1) Refer to vendor O&M Manual. 2) Check selector switch position. 3) Check/repair level controls. 4) Check/repair contactor for welded contacts.

<u>Problem</u>	<u>Result</u>	<u>Remedy</u>
Pump discharge header check valve leaks	Wet well refills quickly after pump stops, resulting in frequent cycling of pump.	Remove and repair or replace check valve.
Pipeline plugs	1) No flow to SWRB 2) Pump deadheads	1) Determine where plug is located by opening the valves located in the cleanouts in successive order. Drain water to a tank truck and transport to SWRB for treatment. 2) Clean out pipeline.

### **3.6 Maintenance**

- 1) Valves: Follow procedures given in current applicable maintenance work instructions.
- 2) Pumps: Refer to pump vendor O&M manuals and current applicable maintenance work instructions.
- 3) Cleaning of the oil-water separator should be performed by the subcontractor when required with disposal of collected materials as directed by FDF.

## 4.0 ACTIVITIES, RECORDS, AND REPORTS

Table 4-1 provides a list of activities, and records and reports associated with the retention basin collection and transfer system. The frequency of each activity is also included in the table. Further details on maintenance and calibration frequencies associated with system equipment are provided in Table 4-2. Refer to Appendix A for vendor-recommended maintenance and calibration procedures. FDF will maintain copies of all pertinent records and reports.

Table 4-1 - Summary of Records and Reports

Report	Frequency
<b>Maintenance and Calibration</b>	
Pump Inspection Report	Annually
Piping Inspection Report	Annually
Valve System Inspection Report	Annually
<b>Other Monitoring</b>	
Check Sumps for Sediment*	Monthly

\* Sediment to be removed and transferred to the OSDF if it meets OSDF Waste Acceptance Criteria.

**Table 4-2 - Equipment Maintenance and Calibration Schedule**

<b>Item</b>	<b>Maintenance Schedule</b>
<b>Pumps</b>	<b>Inspect annually per FDF MWI PCP100</b>
<b>Control Panel</b>	<b>Annually</b>
<b>Main Disconnect Switch and Starter</b>	<b>Inspect monthly for moisture</b>
<b>Indicating Lights</b>	<b>"Push-to-test" monthly</b>
<b>Motor Starters and Controls</b>	<b>Annually</b>
<b>Main Disconnect Switch</b>	<b>Monthly</b>
<b>Water Level Probe Calibration</b>	<b>Semi-annually</b>